Arsenic Poisoning : In Search of a Remedy

Bangladesh is the most densely populated country in the world having contaminated ground water with arsenic. Despite having abundant rivers and high annual rainfall as source of water, groundwater is the major source of drinking water for over 130 million people. Arsenic in drinking water in the Ganges delta of India is now recognized as one of the world's largest environmental health problems[1].

Dense population on a limited surface area causes vigorous extraction of ground water by thousands of bore holes and tube-wells in Bangladesh as drinking water and for irrigation during drought season. Due to this heavy extraction, there is marked fluctuation of water table before and after the monsoon season. During such fluctuation, pyrites are decomposed and arsenic leaches out from pyrites.

Exposure to arsenic adversely affects multiple organ systems. Following ingestion, arsenic is absorbed and distributed widely to almost all tissues of the body e.g. liver, spleen, kidney, heart, lungs, intestine, brain, muscle, and thyroid. The toxicity of arsenic compounds depend on the amount, duration and the chemical and physical form of arsenic[2] e.g. trivalent and inorganic arsenic is more toxic than pentavalent and organic arsenic.

The National Research Council in Washington, USA reported the possible roles played by cysteine, folic acid, vitamin B_{12}, zinc and selenium deficiencies in increasing individual susceptibility to the toxic effects of arsenic. Clearly there are grounds for particular concern at the role which malnutrition might play in the Bangladesh setting, and the need to know more than is currently known about the interaction between diet and susceptibility.

Treatment of arsenic toxicity was first actively accomplished by the threat of poison gas 'lewisite' in warfare. Since then the search for a specific antidote against arsenic poison become a focal concern of the medical science. Though acute toxicity is rare in comparison to that of chronic, there is no specific treatment for chronic arsenic toxicity.

For acute toxicity, the British developed dimercaprol, which is known as British Anti Lewisite (BAL), a sulphonate derivative known as Unithiole developed by former Soviet Union was the mainstay of treatment. They act by forming soluble chelate with arsenic that can be excreted in the urine. Dimercaptosuccinic acid (DMSA) and Dimercapto propane sulphonate (DMPS) were used in Europe for treatment of chronic arsenic toxicity and also for mercury poisoning. Penicillamine, an analogue of cysteine is also used as chelating agent in acute arsenic toxicity[3]. But all these have serious unwanted effects and high dose with very narrow therapeutic index.

In chronic arsenic toxicity, the mode of treatment is different. Because chronic toxicity develops very slowly and silently for a prolong period. Therefore, the prevention of further exposure to arsenic is to be considered at first. Prevention of accumulation, reversing the affected or altered biological functions and rapid elimination of arsenic are the further objectives of treatment in chronic toxicity. No specific therapeutic regimen for chronic arsenicosis is proven of benefit. World Health Organization has recommended finding out an alternative indigenous drugs and other means including vitamins, nutritious diet, chelating agents and antioxidants for those who have already been exposed to arsenic. Taking it into account, the role of alpha-lipoic acid on metabolism of arsenic has been evaluated in animal model by a young researcher and disseminated the findings as an original article in this issue. Further researches to be done in search of remedy for arsenic toxicity to save millions of people from the unseen disasters in near future.

1. Elizabeth MJ. Arsenic 2000: An overview of the arsenic issue in Bangladesh. Water Aid Bangladesh 2000. pp-1-63.
2. W.H.O. Environmental Health Criteria-18. Geneva, UNEP, ILO, WHO.. 1981. pp-13-146.
3. Douglas RM. Health aspects of arsenic contamination of tube-wells in Bangladesh. In: Final report of a consultancy visit for the World Bank to Bangladesh 1999. pp- 5-26.

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